Health Consultation

HERCULANEUM LEAD SMELTER (DOE RUN COMPANY)
(a/k/a HERCULANEUM LEAD SMELTER SITE)

HERCULANEUM, JEFFERSON COUNTY, MISSOURI

EPA FACILITY ID: MOD006266373

MAY 8, 2002

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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Prepared by:

Exposure Investigations Section
Division of Health Assessment and Consultation
Agency for Toxic Substances and Disease Registry

Background and Statement of Question

The Environmental Protection Agency (EPA), Region VII, provided the Agency for Toxic Substances and Disease Registry (ATSDR) with environmental contamination data for Herculaneum, Missouri. The data included analytical results for surface soil and ambient air particulate samples collected in Herculaneum in late 2001.

The samples were collected from the community surrounding an active lead smelter operated by the Doe Run Company. The smelter uses a lead ore concentrate as its source material. Much of this lead concentrate is brought to the facility by covered trucks that travel along public roads in Herculaneum. Testing conducted by the EPA documented the presence of lead contamination along the haul routes. The source of this contamination may be lead ore concentrate that fell or blew off the transport trucks. The company has attempted to remediate the contamination by vacuuming up dust and ore particles along the road.

The EPA provided data for surface soil samples collected from residential properties in Herculaneum in October 2001. The samples were analyzed using Inductively Coupled Plasma - Mass Spectroscopy (ICP-MS) for selected metals, including arsenic, cadmium, and lead. This health consultation is based on soil samples from 203 residential properties.

In addition, the EPA collected air particulates at four ambient air monitoring stations in the community during October 13 to December 22, 2001. A 24-hour air sample was collected every three days, yielding 24 samples from each station. These samples were also analyzed for arsenic, cadmium, and lead.

Residents of the town asked ATSDR to evaluate the data and determine if the levels of arsenic and cadmium detected in these environmental samples warrant conducting an Exposure Investigation to assess human exposure to these contaminants.

Data Summary

Soil

The concentrations of arsenic detected in the residential surface soil samples ranged from 2 to 42 milligrams per kilogram (mg/kg) or parts per million (ppm). The average soil arsenic concentration was 9.6 ppm, and the median concentration was 8 ppm.

The concentrations of cadmium detected in the residential surface soil samples ranged from 1 to 160 ppm. The average soil cadmium concentration was 18.8 ppm, and the median concentration was 12 ppm.

The concentrations of lead detected in the residential surface soil samples ranged from 43 to 24,000 ppm. The average soil lead concentration was 2,310 ppm, and the median concentration was 1,300 ppm.

The average soil arsenic concentration was 9.6 ppm, and the maximum concentration was 42 ppm. As discussed below, these levels are less than soil levels that would be expected to cause a measurable increase in the body burden of arsenic.

In Anaconda, Montana, the Centers for Disease Control and Prevention conducted a study in which they measured urine arsenic concentrations in children (2-6 years old) who lived near a copper smelter that had contaminated the soil with high concentrations of arsenic (average soil arsenic concentrations of 400-700 ppm) [2,3]. Based on the results of this study, the researchers concluded that elevations in urine arsenic levels were unlikely to occur at soil concentrations below 100 ppm. Since the highest soil concentration of arsenic detected in Herculaneum was 42 ppm, it is unlikely that biological monitoring for arsenic in the residents would provide evidence for increased exposure.

Few studies of biological monitoring for environmental exposure to cadmium have been conducted. However, in one such study, young children who lived near an active cadmium refinery in Colorado were monitored for cadmium and arsenic exposure [4]. Soil and air contaminant levels were not reported in this referenced article, but based on ATSDR's Public Health Assessment for the site, cadmium and arsenic levels in the soil and air in off-site areas were generally higher than those reported for Herculaneum [5]. In the Colorado study, the researchers concluded that all the children's urine arsenic and cadmium levels were within the normal range. Therefore, it is unlikely that biomonitoring for cadmium or arsenic in residents of Herculaneum would provide evidence for increased exposure to these soil contaminants.

Conclusions

Environmental monitoring data indicate that elevated concentrations of arsenic and cadmium were detected in some soil samples collected from residential yards in Herculaneum. Although elevated, these concentrations are below levels that would be expected to cause an elevated body burden of arsenic or cadmium that would be detectable by biological monitoring.

Whenever environmental contamination with arsenic or cadmium was detected, lead at much higher concentrations was also present. Therefore, remedial actions directed at lead contamination would simultaneously address the areas of arsenic and cadmium contamination.

Recommendations

(1) Based on the data reviewed, biological monitoring for arsenic or cadmium is not indicated.

(2) Health officials should continue to monitor blood lead levels in children who live in the area.

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References

(1) Jim Silver, U.S. Environmental Protection Agency - Region VII; personal communication; March 19, 2002.

(2) S Binder, D Forney, W Kaye, and D Pascal; Arsenic exposure in children living near a former copper smelter; Bull. Environ. Contam. Toxicl. 39 114-121 (1987).

(3) S Binder; The case for the NEDEL (the no epidemiologically detectable exposure level); Am J Pub Health 78 589-590 (1988).

(4) K Gottlieb, JR Koehler, and J Tessari; Non-analytic problems in detecting arsenic and cadmium in children living near a cadmium refinery in Denver, Colorado; J Exp Anal Env Epid 3(2) 139-153 (1993).

(5) Agency for Toxic Substances and Disease Registry; Public Health Assessment for ASARCO Incorporated (Globe Plant); May 3, 1995.